NEW HAMPSHIRE DEPARTMENT OF Environmental Services

A Forum on The Transition from MtBE to an Ethanol Blend Gasoline and the Oil Compliance Act of 2005

Lynn A. Woodard, P.E.
Waste Management Division

February 24, 2006

Forum on Ethanol-Blend Gasoline

Agenda

February 24, 2006

9:00 .. Greetings and Introduction

9:15 .. Transitioning from MtBE to Ethanol - what is going on and why

11:00 .. Break

11:15 .. Q&A

12:00 .. UST Compliance Act of 2005

12:30 .. Q&A

1:00 .. Your free to go

A Little History

- 1970s Ethanol used as an octane enhancer
- 1980s Reduction of lead increased the use of ethanol – remember gasohol?
- 1995 Reformulated Gasoline (RFG) in ozone non attainment areas

A Little History Cont:

- 2000 Phase II RFG
  - 2.0% Oxygen by wt.
  - Additional MtBE to meet the O_2 requirement
  - Good air-bad water
- 2005 Energy Policy Act
  - Elimination of O_2 content requirement
    - 270 days after Act or May 5, 2006

A Little History Cont:

Renewable Fuels Requirement - % in gasoline for 2006 must = 2.78%

Calendar Yr.	Gallons (B)
2006	4.0
2007	4.7
2008	5.4
2009	6.1
2010	6.8
2011	7.4
2012	7.5

Transitioning to Ethanol (E-10)

- New Hampshire's Statutory Ban on MtBE

RSA 146-G:12 – Effective Jan. 1, 2007

- No person, as defined in RSA 146-A:2, VI, shall sell, deliver for sale, import, or cause to be imported into the state for sale any neat gasoline ethers or gasoline containing MtBE, other gasoline ethers, or tertiary butyl alcohol (TBA) in quantities greater than ½ of one percent by volume.

Transitioning to Ethanol

- Caught off Guard
  - Industry introducing ethanol-blend sooner than expected
    - Check with your distributor find out where and when they anticipate introducing ethanol-blend gasoline
    - Check with your distributor to determine if they will supply you with conventional gasoline

Transitioning to Ethanol

A tentative schedule

Name of Company	Anticipated Date of Ethanol-Blend Introduction
Irving Oil	On-going
Getty	On-going
Gulf Oil	April
ExxonMoble	May
Conoco Philips	May
Citgo	May
Shell Oil	May

Transitioning to Ethanol

- **NHDES Basic Outreach Information**
  - Post Card
  - Fact Sheet - http://des.nh.gov/factsheets/rem/rem-26.htm
  - Letter to UST facilities with fiberglass tanks installed prior to 1980
  - Forum
  - Power Point Presentation on internet

Transitioning to Ethanol

- **What you should know about ethanol (C_2H_5OH)**
  - It has been used as an octane enhancer since the late 1970s
  - All vehicles sold in the U.S. are designed to use an E-10 blended gasoline
    - Exception – vintage vehicles, boats w/fiberglass gas tanks, etc.
  - It is an oxygenate and will replace the use of MtBE

Transitioning to Ethanol

- **What you should know about ethanol cont:**
  - Water Solubility in product – Infinite!
  - It acts as a solvent!
  - It promotes more complete combustion
  - It has a lower Btu/gal – may note a small decrease in fuel economy (1 to 3%)

Transitioning to Ethanol

Properties of Oxygenates

Property	Ethanol	MtBE
Oxygen, Wt.%	33	18.2
Blending Octane, (R+M)/2	113	109
Neat Vapor Pressure, psi	3.5	7.8
Blending Vapor Pressure, psi	18	8
Energy Content, Btu/gal	76M	94M
Density (lbs/gal@60 F)	6.58	6.2
Blend Max. Oxygen, wt.%	3.5	2.7
Water Solubility in product %	Infinite	1.4

Transitioning to Ethanol

- **Materials Not Compatible w/ Ethanol**
  - Metals
    - Aluminum dispensing equip. where ethanol is >10%
  - Elastomers
    - Buna-N (seals only)
    - Neoprene (seals only)
    - Urethane rubber

Transitioning to Ethanol

- **Materials Not Compatible Cont:**
  - Polymers
    - Polyurethane
    - Alcohol-based pipe dope (recently applied)
  - Materials possibly unsuitable are fiberglass-reinforced polyester and epoxy resins. Some fiberglass –reinforced polyester and epoxy resins have been reported to be softened.
  - Note: Source of information – ADM's Fuel Ethanol Tech. Man. (2003)

Transitioning to Ethanol

- **General Statement**
  - All storage tanks dedicated to an ethanol-blend must be water-free and clean before the introduction of an ethanol-blend gasoline!
    - It is generally recommended if there is more than ½ inch of water, it should be pumped out
    - All sludge should be removed from the tank bottoms

Initial Preparation

- **Compatibility Issues**
  - Tanks lined with epoxy or polyester coatings prior to 1980 are not suitable for ethanol–blend gas.
  - Tanks, meters, pumps, hoses, filters, pipe sealants, plastics, elastomers, and other materials should be inventoried and checked.

Initial Preparation

- **Compatibility Issues Cont:**
  - Meters – should be of a type manufactured for the handling of ethanol
  - Pumps – seals and packing construction vary, check with manufacturer
  - Hoses – deterioration of Dayco Corp. gas pump hoses is negligible

Initial Preparation

- **Compatibility Issues Cont:**
  - Filters – screens and filters generally not affected – a few paper-type filters containing shellac as the adhesive may cause problems
  - Pipe sealants – Teflon tape is the best pipe sealant to use. Some pipe sealants have an alcohol base and may be softened and washed away by ethanol-blend gasoline

Initial Preparation

- **Check For Water!**
  - Are your UST systems taking on water?
    - Check records for history of water
    - Stick tanks for water
      - Tank may be tilted – check both ends
        - Remove water
    - Check for water intrusion
      - Are fill caps tight?
      - Do spill buckets leak – is plug operational and secure?

Initial Preparation

- **Check For Water Cont:**
  - Check grading to make sure storm water or snow and ice is not a problem
    - Re-grade if necessary

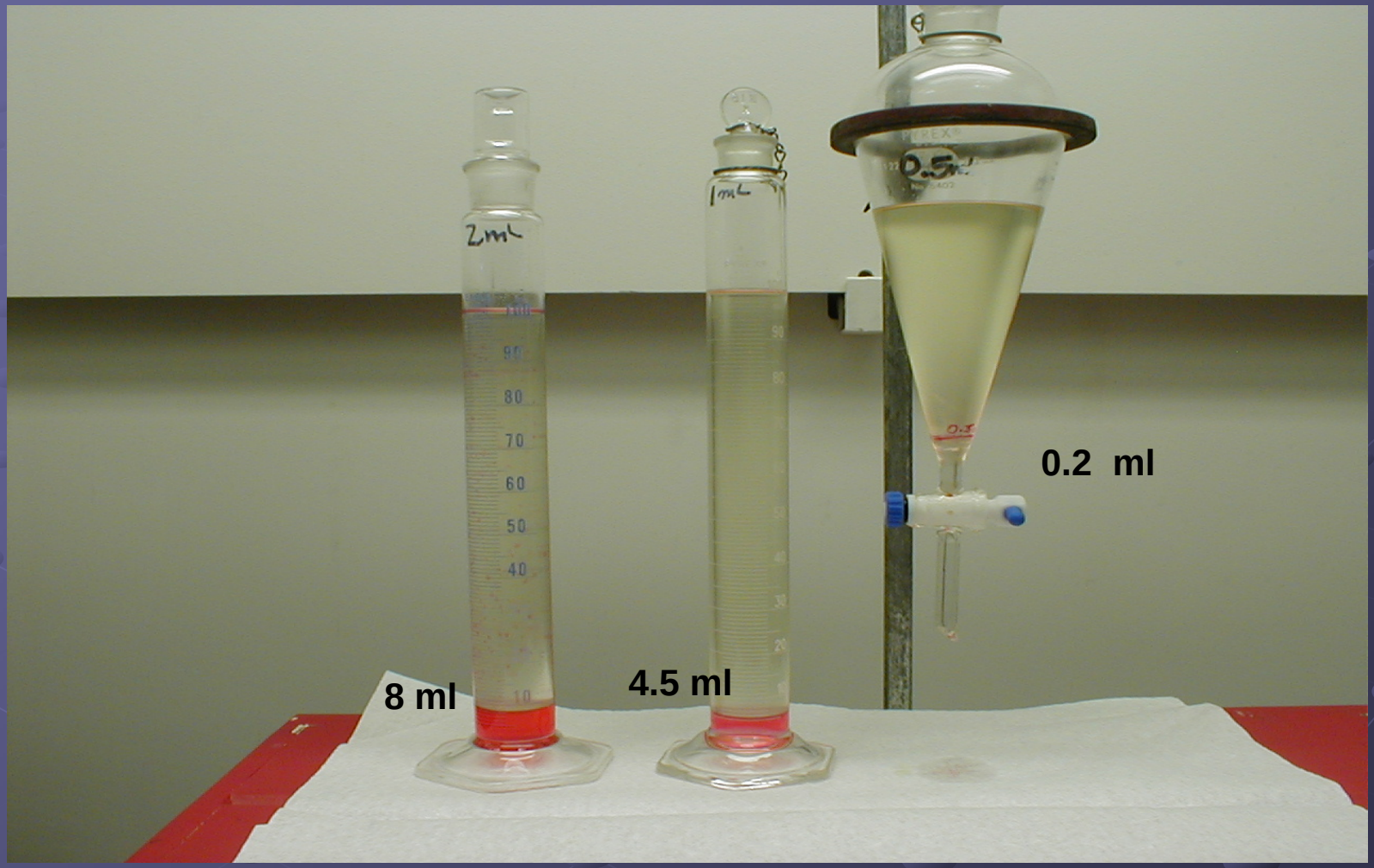
Initial Preparation

- **Water is your Enemy!**
  - Intrusion of water must be avoided at all times
    - When water exceeds the tolerance level of about 0.5% phase separation may occur.
    - Depending on individual conditions, about 40 to 60% of the ethanol will be drawn away from gasoline by the water
  - Note: Source of information – ADM's Fuel Ethanol Tech. Man. (2003)

Initial Preparation

- **Water is your Enemy Cont:!**
  - Example:
    - 10,000 gallon UST
    - 96” Dia. x 26’8” L
    - 0.5% water = 50 gal. = 2” water
    - 40 to 60% ethanol will partition out of gasoline
    - 10% ethanol = 1,000 gal.
    - 50% x 1,000 gal. = 500 gal.
    - 500 gal. ethanol + 50 gal. water = 550 gal. ethanol/water
    - 550 gal. ethanol/water = 10” h in tank

Ethanol Separation Lab Data



2 ml of water in 100 ml of E10 Gas

1 ml of water in 100 ml of E10 Gas

.5 ml of water in 100 ml of E10 Gas

Ethanol Separation Lab Procedure

1. The gasoline to be used in the lab procedure was analyzed for ethanol content
2. An aliquot of water was placed in a graduated cylinder
3. 100mL of E-10 gasoline was placed into the cylinder
4. The cylinder was vigorously mixed for approx. 1 min.
5. The mixture was allowed to settle
6. The water-ethanol level (mL) was read and recorded

Ethanol Separation Lab Results

Initial Water Vol. (mL)	Water-Ethanol Vol. (mL)	Vol. Diff. (mL)	% Ethanol Separation
0.5	0.2	-0.3	0
1.0	4.5	3.5	35
2.0	8.0	6.0	60
5.0	12.5	7.5	75
10	17.5	7.5	75
20	27.5	7.5	75
50	59	9	90

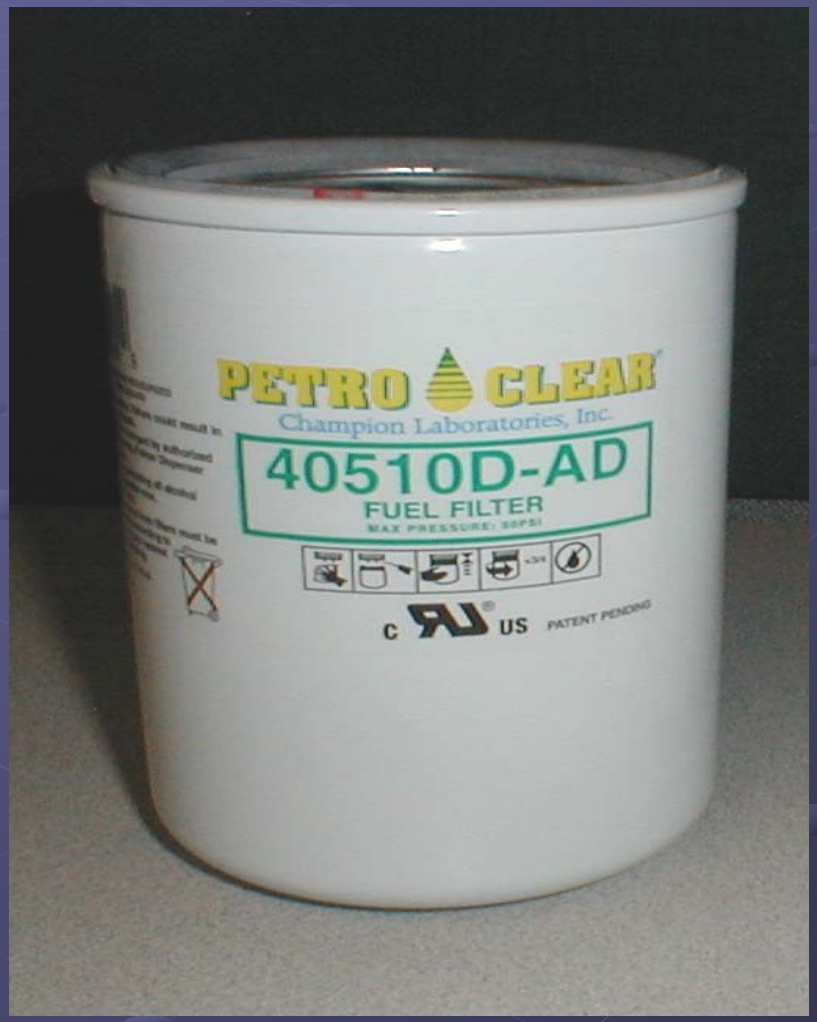
Initial Preparation

- **Water is your Enemy Cont:**
  - What happens if phase separation occurs?
    - An ethanol-water mixture will be pumped to dispenser
      - Filter will plug and stop flow or
      - Ethanol-water mixture will be dispensed to vehicles
        - Customers will be very unhappy!
    - Octane of remaining gasoline will be lower
      - Tank should be emptied or supplemental ethanol should be added to return the octane to the proper rating

Initial Preparation

- **Purchase Water Sorbing Dispenser Filters**
  - CIMTEK
    - Wayne Dispensers 300 MGA # 70035
    - Gilbarco Dispensers 400 MGA # 70035
  - Petroclear
    - Wayne Dispensers # 45410A
    - Gilbarco Dispensers # 45510A-BD

10 Micron Water Sorbing Dispenser Filter



10 Micron Dispenser Filter

Initial Preparation

- **Ethanol/Water Finding Paste**
  - Kolor Kut Products Company
    P.O. Box 5415
    Houston, TX 77262
    Phone: (713) 926-4780

    The Sartomer Company
    468 Thomas Jones Way
    Exton, PA 19341
    Phone: (610) 363-4100

Alcohol Compatible Water Finding Paste

Alcohol Compatible Water Finding Paste

- Gauging Water Bottoms
  - Allow 1 min. for reaction to occur
  - Red means – pure water
  - If brown turns to mustard, then back to brown in approx. 30 sec., this is normal
  - If brown turns to mustard, stays mustard and red spots begin to appear separation has occurred.

Initial Preparation

- **Ethanol Acts as a Solvent**
  - Clean sludge from tank bottoms
  - If tanks have been repaired check materials used in repair for compatibility

Conversion Day

- **Just Prior to First Load**
  - Stick tanks for water
    - If present remove
  - Install water sorbing 10 micron filters
  - Label dispensers for ethanol

Label Dispensers for Ethanol

CONTAINS 10%

ALCOHOL/ETHANOL

Conversion Day

- **Just Prior to First Load Cont:**
  - Mark equipment in accordance with API Recommended Practice 1637A
    - Fill bucket covers
    - Fill pipes

Conversion Day

- **Examples of Fill Pipe Tags**

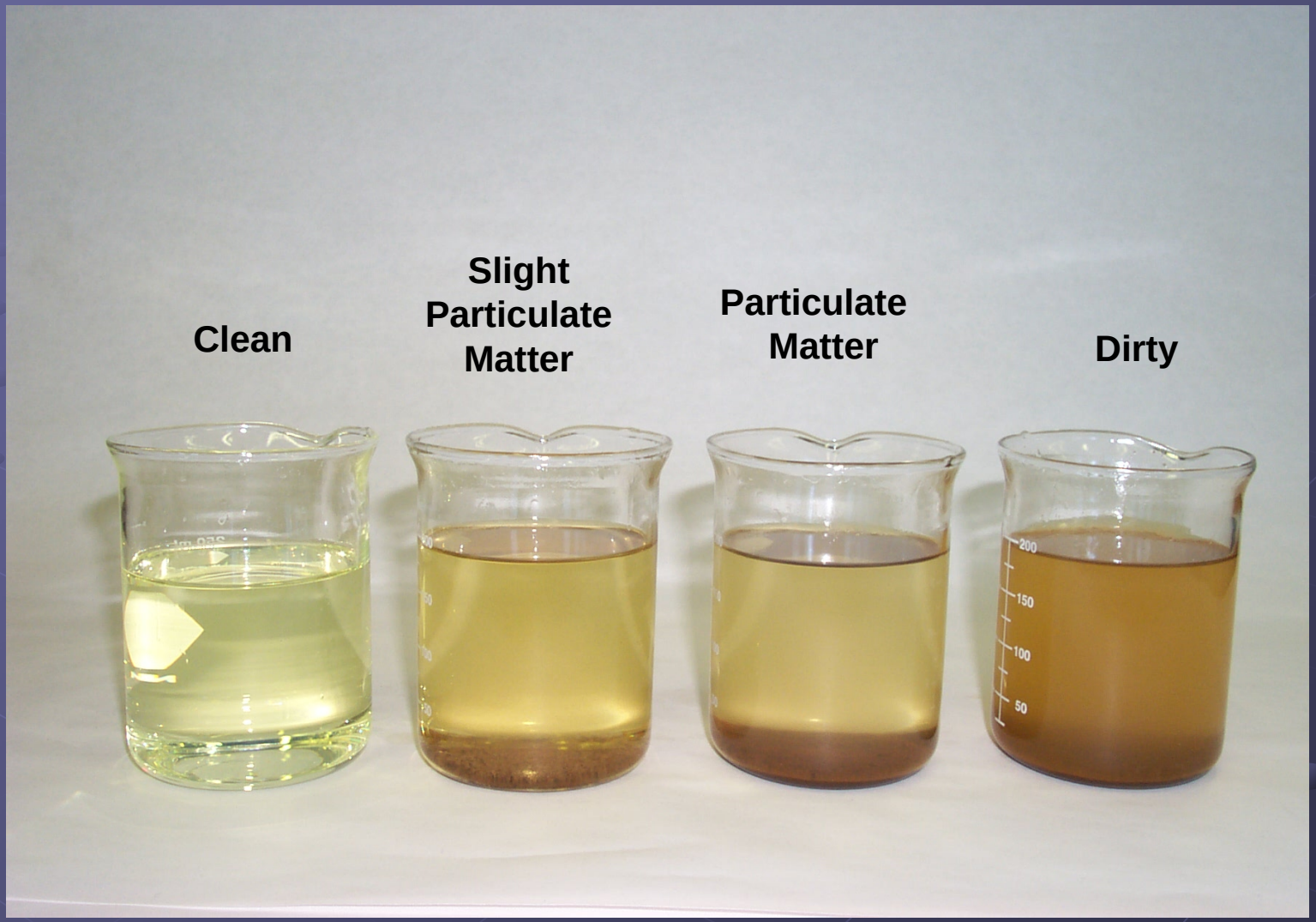
Conversion Day

- **Just Prior to First Load Cont:**
  - Draw tank down as low as possible
  - Pump water from bottom of tank until tank is empty
  - Shut down dispenser use

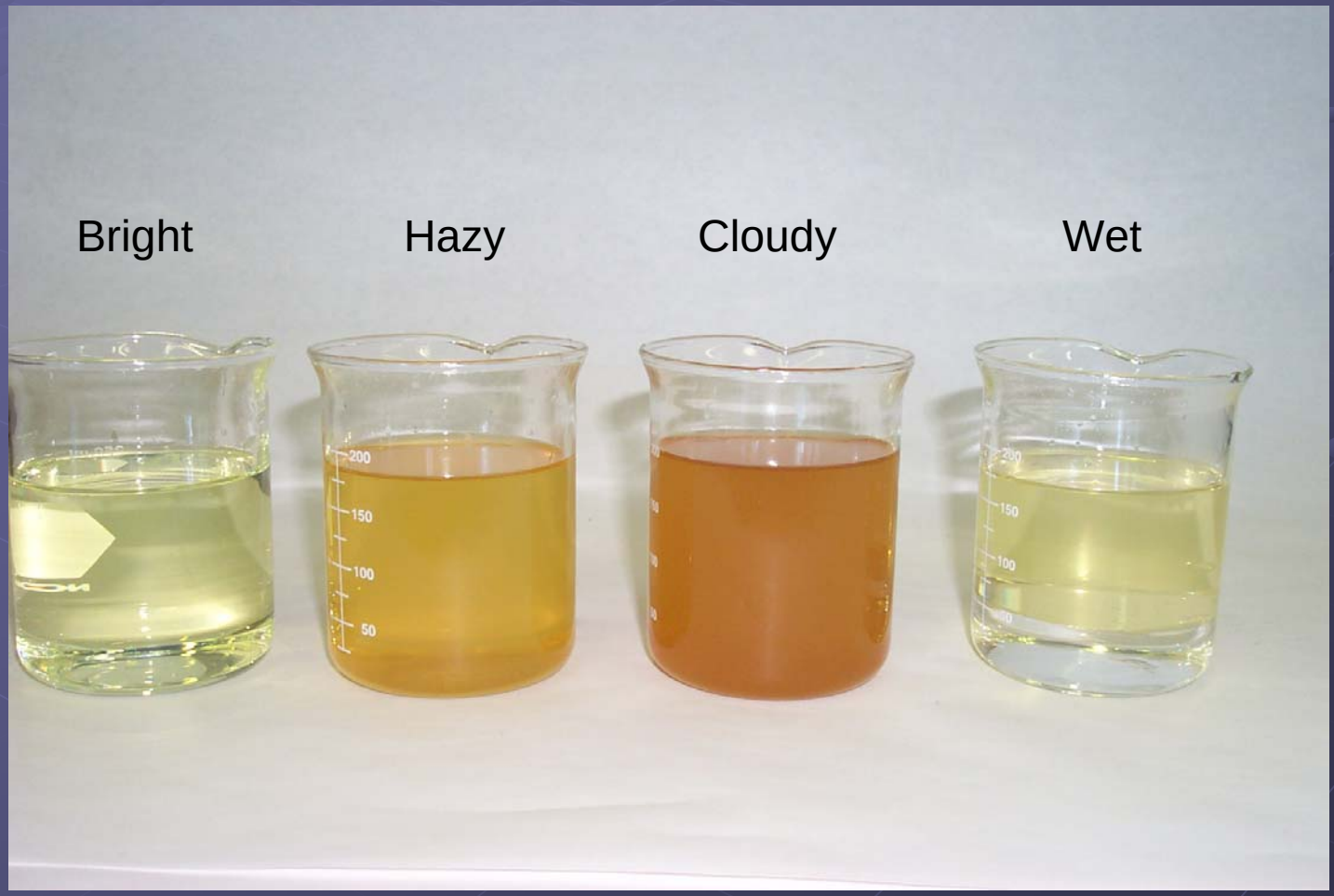
Conversion Day

- **Ethanol-Blend Introduction**
  - Fill tank to 80% to 90%
  - Purge all dispenser pumps until product is clear and ethanol content is 10%
    - Check with field test kit, or
    - Calibration chart

Solid Contaminant Standards



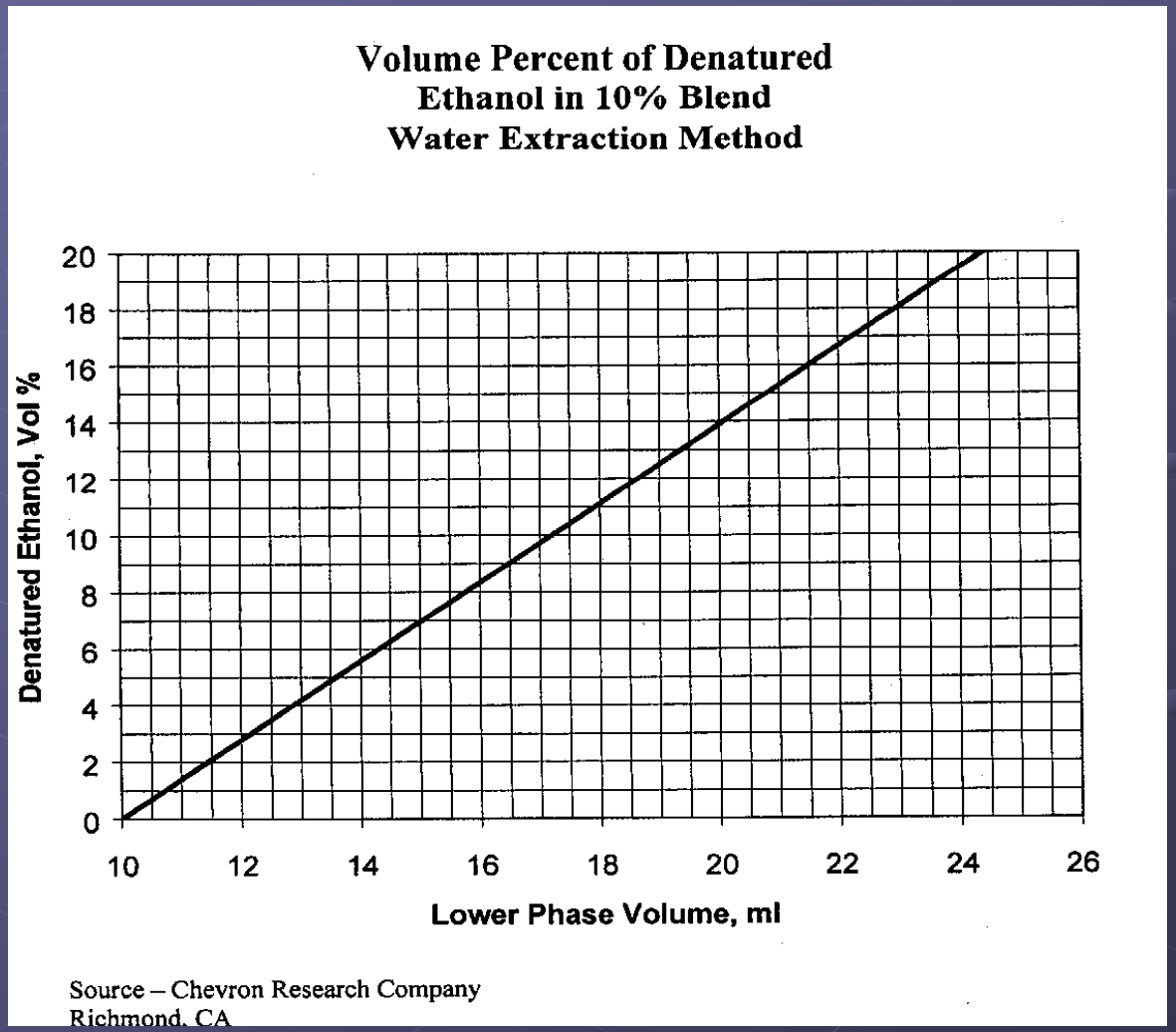
Moisture Content Standards



Conversion Day

- **Ethanol Content % Check**
  - Place 100 ml of the ethanol/gasoline blend in a 100 ml glass stoppered graduated cylinder. Pipette 10 ml of water into the cylinder and shake thoroughly for about one minute. Read the volume of the alcohol-water layer on the bottom. Use the calibration curve to read the alcohol content.

Ethanol % Calibration Chart



After Conversion

- Daily Chores
  - Stick tanks with water finding paste
  - Check spill/fill buckets, before and after deliveries, and/or rain events
  - Check spill/fill bucket plug
  - Keep fill caps secure at all times
  - Keep snow and ice away from fill opening
  - If flow at pump slows replace filter

Other Items

- Continue to use water sorbing filters until you are sure the tank is dry – two to three weeks or several volume changes
- When discontinuing the 10 micron water sorbing filters, install the 10 micron particulate matter filters
  - Ethanol will loosen rust, varnish, gum, etc.

Other Items

- Fiberglass Double Wall Tanks with Brine filled Interstitial Space
  - If level of brine goes down – shut down tank until you determine why
    - Salt water in gasoline column will damage vehicles' pumps and engines
- Recalibration of Pumps
  - After two to three weeks you may want to recalibrate your pumps

Summary

- Ethanol Blends have been around since the mid-’70s
- If you have a question about the compatibility of your equipment contact the manufacturer
- Most vehicles are compatible with E-10 gasoline
- Water is your enemy - you must keep your tanks dry

Contact Information:

Lynn A. Woodard, P.E.
Supervisor, Oil Compliance Section
Waste Management Division
NHDES
Phone: 603-271-1165
E-mail: lwoodard@des.state.nh.us

Fact Sheet: http://des.nh.gov/factsheets/rem/rem-26.htm

UST Compliance Act of 2005

UST Compliance Act of 2005

- August 8, 2005
  - President Bush signed the Energy Policy Act of 2005 (Public Law 109-58)
  - Title XV - Ethanol and Motor Fuels
    - Subtitle B – Underground Storage Compliance Act (UST Compliance Act of 2005)

Amendments to Subtitle I of the Solid Waste Disposal Act

- The Act expands the eligible uses of the LUST Trust Fund for:
  - UST inspections
  - UST operator training
  - Fuel oxygenate remediation
  - Delivery prohibition
  - Installer/manufacturer responsibility

LUST Trust Fund

Balances/Earnings/ Appropriations	$Millions
Bal. beginning - 2005	$2,147
Total receipts & collections	$271
Total appropriations	$69
Bal. end – 2005	$2,349

Amendments to Subtitle I of the Solid Waste Disposal Act

- Schedules for compliance
  - Mandates are phased in over a 12 to 48 month period
  - EPA must write guidelines for states to follow
  - All or nothing concept

Amendments to Subtitle I of the Solid Waste Disposal Act

- UST Inspections
  - Un-inspected tanks
    - Not inspected since December 22,1998
    - must be inspected within two years of Act
  - Periodic inspections
    - Every 3 years after initial inspection

Amendments to Subtitle I of the Solid Waste Disposal Act

- Operator Training
  - Not later than 2 years after EPA guidance, the state shall develop state-specific training requirements for:
    - Persons having primary responsibility for on-site operation
    - Persons having daily on-site responsibility O&M
    - Daily on-site employees – emergency response

Amendments to Subtitle I of the Solid Waste Disposal Act

- Remediation From Oxygenated Fuel Additives
  - The USTCA specifically makes provisions for funds to be used for corrective action for cleanup of oxygenated fuel releases

Amendments to Subtitle I of the Solid Waste Disposal Act

- Release Prevention, Compliance, and Enforcement
  - Allows funds to be used for:
    - Conduct Inspections
    - Issue Orders
    - Bring other legal actions

Amendments to Subtitle I of the Solid Waste Disposal Act

- Government Owned Tanks
  - State compliance report due 2 years after Act
    - List location and owner of each government tank
    - Specify date of last inspection, deficiencies, and action taken
    - Government owned or operated tanks means – federal, state, or local

Amendments to Subtitle I of the Solid Waste Disposal Act

- Government Tanks – Not a Safe Harbor
  - State must make annually updated information available to the public:
    - The number, sources, and causes of UST releases
    - Record of compliance
    - Data on number and type of equipment failures

Amendments to Subtitle I of the Solid Waste Disposal Act

- Delivery Prohibition
  - Two years after the Act, it shall be unlawful to deliver to, deposit into, or accept a regulated substance into an UST at a facility which has been identified to be ineligible to receive product.

Amendments to Subtitle I of the Solid Waste Disposal Act

- Federal Facilities – Required Reports
  - By Aug. 8, 2006 federal facilities must report the following to the EPA Administrator:
    - Location and owner of each UST
    - All USTs not in compliance
    - Date of last inspection of each UST
    - Each violation
    - Description of operator training offered
    - Corrective action taken or will be taken

Amendments to Subtitle I of the Solid Waste Disposal Act

- Additional Measures to Protect Groundwater
  - One of the following is required:
    - Secondary containment or
    - Financial Responsibility (FR) and Certification

Amendments to Subtitle I of the Solid Waste Disposal Act

- Secondary Containment
  - Any new or replaced UST or piping located within 1,000 ft. of any existing community water system or any existing potable drinking water well is required to have secondary containment.

Amendments to Subtitle I of the Solid Waste Disposal Act

- **Financial Responsibility and Certification**
  - A manufacturer or installer of an UST shall maintain evidence of financial responsibility
  - The EPA shall require that a person that installs an UST system is:
    - Certified or licensed by the manufacturer
    - Certified or licensed by EPA or state
    - Has installation certified by licensed P.E.
    - Has had installation inspected by EPA or state
    - Is compliant with appropriate national codes

Topic	Task	EPA Guidelines Date	Implementation Date
Inspections	▪ Determine which sites have not been inspected since 12/22/98 ▪ Inspect all previously un-inspected facilities ▪ Periodic Inspections once every 3 yrs.		Immediately 8/8/2007 Starts after all un-inspected facilities have been inspected or 8/8/2006
Operator Training	▪ Develop State specific Training requirements based on EPA Guidance	8/08/2007	8/08/2009
MtBE Remediation	▪ Oversee cleanup of eligible sites		Commencing after award of Cooperative Agreement
Delivery Prohibition	▪ Prohibit delivery to UST facilities identified as being ineligible to receive product	8/08/06	8/08/07
State Compliance Report	▪ State shall report to EPA on Government owned USTs		8/08/07
Add. measure to protect groundwater	▪ Require secondary containment or FR and certification for manufacturers and installer of tank systems within 1,000ft. of community drinking water source or potable well		2/08/2007

Questions?

Contact Information

- Energy Policy Act of 2005
  - http://www.doi.gov/iepa/EnergyPolicyActof2005.pdf

- Lynn A. Woodard, P.E.
  Supervisor, Oil Compliance Section
  Waste Management Division
  NHDES
  Phone: 603-271-1165
  E-mail: lwoodard@des.state.nh.us